(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 November 2002 (14.11.2002)

PCT

(10) International Publication Number
WO 02/091748 A1

(51) International Patent Classification[7]: H04N 7/24

(21) International Application Number: PCT/IL02/00324

(22) International Filing Date: 24 April 2002 (24.04.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/288,081 3 May 2001 (03.05.2001) US

(71) Applicant *(for all designated States except US)*: **OPTIBASE** [IL/IL]; 7 Shenkar Street, 46725 Herzlia (IL).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **LIFSHITZ, Zvi** [IL/IL]; 7 Ha-Yaen Street, 96900 Jerusalem (IL).

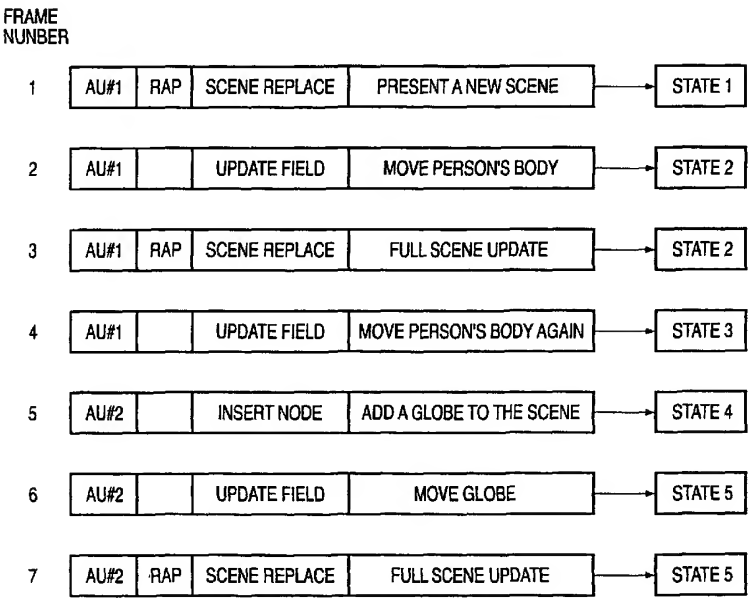
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *entirely in electronic form (except for this front page) and available upon request from the International Bureau*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A SYSTEM FOR ERROR-RESILIENCE IN COMMUNICATION OF AUDIO-VISUAL OBJECTS



(57) Abstract: A numeration indicator field and a synchronization point flag field are added to an SL-packet header, to increase error resilience of MPEG-4 System streams, as follows: 1. The numeration indicator of an access unit is incremented if and only if the access unit conveys a fundamental scene change; 2. The synchronization point flag of an access unit is set to 1 and the numeration indicator of the access unit is set equal to the numeration indicator of an exactly preceding access unit to indicate no change of scene.

WO 02/091748 A1

A SYSTEM FOR ERROR-RESILIENCE IN COMMUNICATION OF AUDIO-VISUAL OBJECTS

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

This patent application claims priority from and is related to U.S. Provisional Patent Application Serial Number 60/288,081, filed May 3,2001, this U.S. Provisional Patent Application incorporated by reference in its entirety herein.

FIELD OF THE INVENTION

The present invention relates to computer network-based multimedia applications in general, and more particularly to error resilience of Systems streams in MPEG-4.

BACKGROUND OF THE INVENTION

ISO/IEC 14496, commonly referred to as "MPEG-4", is an international standard for the communication of interactive audio-visual scenes. This specification includes the following elements:

1. The coded representation of natural or synthetic, two-dimensional (2D) or three-dimensional (3D) objects that can be manifested audibly and/or visually (audio-visual objects) (specified in part 1,2 and 3 of ISO/IEC 14496);
2. The coded representation of the spatio-temporal positioning of audio-visual objects as well as their behavior in response to interaction (scene description, specified in part 1 of ISO/IEC 14496);

3. The coded representation of information related to the management of data streams (synchronization, identification, description and association of stream content, specified in part 1 of ISO/IEC 14496); and
4. A generic interface to the data stream delivery layer functionality (DMIF - specified in part 6 of ISO/IEC 14496).

The overall operation of a system communicating audio-visual scenes can be paraphrased as follows:

At the sending terminal, the audio-visual scene information is compressed, supplemented with synchronization information and passed on to a delivery layer, that multiplexes it into one or more coded binary streams that are transmitted or stored.

At the receiving terminal, these streams are de-multiplexed and decompressed. The audio-visual objects are composed according to the scene description and synchronization information and presented to the end user.

The end user may have the option to interact with this presentation. Interaction information can be processed locally or transmitted back to the sending terminal.

ISO/IEC 14496 defines the syntax and semantics of the bit-streams that convey such scene information, as well as the details of their decoding processes.

Scene description addresses the organization of audio-visual objects in a scene, in terms of both spatial and temporal attributes. This information allows the composition and rendering of individual audio-visual objects after the respective decoders have reconstructed the streaming data for them. The scene description is represented using a parametric approach (BIFS - Binary Format for Scenes). The description consists of an encoded hierarchy (graph) of nodes with attributes and other information (including event

sources and targets). Leaf nodes in this graph correspond to elementary audio-visual data, whereas intermediate nodes (scene description nodes) group this material to form audio-visual objects and perform grouping, transformation, and other such operations on audio-visual objects. The scene description can evolve over time by using scene description updates.

In order to facilitate active user involvement with the presented audio-visual information, ISO/IEC 14496-1 provides support for user and object interactions. Interactivity mechanisms are integrated with the scene description information, in the form of linked event sources and targets (routes), as well as sensors (special nodes that can trigger events based on specific conditions). These event sources and targets are part of scene description nodes, thus allowing close coupling of dynamic and interactive behavior with the specific scene at hand.

Some objects can be stand-alone objects, like "furniture" or "globe" (Figs. 2 and 3), in which the object description contains all the necessary information to present the object. Other objects require a stream of additional data, dynamically consumed during the presentation. Such is, for instance, the "voice" object (Figs. 2 and 3), which gets its content from an audio stream. So, in addition to the scene description described above, the MPEG-4 standard provides a mechanism for defining stream objects, and for linking them to the scene objects. This is known as the Object Description Protocol (ODP or OD).

The Synchronization Layer (SL) is the part of the standard that deals with the delivery of streams between MPEG-4 devices. A stream is made of "access units" (AUs), which are the smallest data units to which time attributes can be applied, such as

frames in video streams. Access units are packetized in "SL-packets". The packets consist of SL-packet headers and the packet payload, i.e. the data. SL-packet headers contain the information necessary for the synchronization of data, i.e. time stamps. The headers may also contain information used by error-resilience tools.

The scene description itself can be dynamic, i.e. streamed. A BIFS stream is made up of an initial Scene Replace command followed by a series of BIFS-update commands. A BIFS-update command can insert objects into the scene, remove them, or change object properties. This mechanism can be used to create graphic animations. A special type of BIFS stream, called Animation Stream, can be used for creating high-quality, low-bandwidth animations.

The "scene carousel", also called "BIFS carousel", is a mechanism that allows the use of dynamic scenes in broadcast environments. In the broadcast scenarios, it is necessary to supply full scene description periodically, so that terminals that tune-in in the middle of a session will be able to construct the presentation. On the other hand, it is desirable that terminals that are already tuned-in will receive only scene updates. This is necessary, because sometimes the user at the receiving terminal side interacts with the scene and changes it locally, applying changes that might be lost if a full scene refresh is processed.

Another use of the scene carousel is in situations when data is transmitted over unreliable networks. In this case data, including scene updates, can be lost and therefore a periodical full scene refresh is necessary to recover from such losses.

The scene carousel is constructed using a tool provided by the Synchronization Layer. SL-packet headers may contain a field called "AU_sequenceNumber". This field

is regarded as the semantic sequence number of the access unit. When the terminal encounters two consecutive access units with the same sequence number, it understands that the second carries the same information as the first one and therefore can be ignored. In a scene carousel, a sequence of scene updates is followed by a Scene Replace command that conveys the full description of the scene. The scene, as described by the Scene Replace command, is identical to the scene as described by the preceding accumulated updates, therefore the command is delivered as an access unit with the same sequence number as the preceding access unit. Terminals that have successfully processed the update commands will ignore the Scene Replace command, while terminals that need a full scene refresh, whether because they have just tuned-in, or lost data on the network, skip the updates and process the Scene Replace command.

The mechanism is called "BIFS carousel" because it is in common use for BIFS and Animation streams, but since the SL is a general tool in MPEG-4, it can be used for any kind of stream.

The BIFS carousel works well for the broadcast scenario, but it turns out that it does not serve the error-resilience requirements very well. The problem is that every time an update command is lost, the player must wait for the next Scene Replace command and then reset the scene. In many cases, this penalty is far too heavy, as illustrated in an example by Figs. 1A to 1E, which are schematic simplified pictorial illustrations of five states of a virtual world.

In Fig. 1A, the virtual world contains a person in front of a blackboard and a desk. In Figs. 1B and 1C the person moves. In Fig. 1D a globe is added to the world and in Fig. 1E the globe is moved.

Figs. 2 and 3 are schematic illustrations of MPEG-4 scene descriptions that describe the virtual worlds of the given example. In practice, each of these objects would require a complete branch made up of node hierarchy, but are herein presented as single nodes for the sake of simplification. Fig. 2 illustrates the BIFS nodes that construct the initial state of the world, as shown in Fig. 1A and Fig. 3 illustrates the BIFS nodes that construct the final state of the world as shown in Fig. 1E.

Further, with respect to the same example, reference is now made to Fig. 4, which is a schematic simplified illustration of a set of access units that convey the virtual world of Fig. 1A and all subsequent changes of state, up to and including state 5 (Fig. 1E). The first access unit in the set contains a Scene Replace command that conveys the entire scene of state 1 (Fig. 1A). The second and third access units contain Update Field commands that change the position of the person's body into state 2 (Fig. 1B) and then state 3 (Fig. 1C). The fourth access unit inserts a new node, which is the globe. The fifth access unit changes the position of the globe.

If, say, access unit 2 is lost, the receiving terminal waits for the next full Scene Replace command to reset the scene, when actually access unit 2 could be ignored and the next Update field (access unit 3) could have been used for moving the person's body to the correct place. This would have been much better than freezing the scene till next Scene Replace, and then spending precious time on resetting the entire scene and losing changes done locally by the viewer.

SUMMARY OF THE INVENTION

According to teachings of the present invention there is provided an error-resilient mechanism for processing scene description streams in scenarios that involve transmission of interactive MPEG-4 scenes over unreliable networks, using ISO/IEC 14496-1 protocol having SL-packetized streams, wherein each SL packet has a header comprising access units having an AU_sequenceNumber field and a RandomAccessPointFlag field, comprising:

defining a numeration indicator field in said SL packet header;

defining a synchronization point flag field in said SL packet header; and

incrementing the numeration indicator of an access unit in said SL packet header if and only if said access unit conveys a fundamental scene change.

Additionally, according to teachings of the present invention, a scene change is considered fundamental if its loss inhibits correct processing of subsequent data.

Additionally, according to teachings of the present invention, setting the synchronization point flag of a first access unit to 1 and setting the numeration indicator of said first access unit equal to the numeration indicator of a second access unit exactly preceding said first access unit indicates no change of scene over said second access unit.

Additionally, according to teachings of the present invention, setting the synchronization point flag of a first access unit to 1 and setting the numeration indicator of said first access unit equal to the numeration indicator of a second access unit exactly preceding said first access unit provides a synchronization point for lost data.

Additionally, according to teachings of the present invention, there is provided a method of processing scene description streams in scenarios that involve transmission of interactive MPEG-4 scenes, in a receiving terminal, said scene description streams using ISO/IEC 14496-1 protocol having SL-packetized streams, wherein each SL packet has a header comprising access units having an AU_sequenceNumber field and a RandomAccessPointFlag field, comprising the steps of:

defining a numeration indicator field in said SL packet header;

defining a synchronization point flag field in said SL packet header;

receiving a first access unit;

checking if a second access unit, exactly preceding said first access unit has been received;

checking if the numeration indicator of said first access unit is different from the numeration indicator of a last access unit received before said first access unit;

processing said first access unit if said second access unit has been received and the numeration indicator of said first access unit is different from the numeration indicator of said last access unit;

checking if the synchronization point flag of said first access unit is set, if said second access unit has been received and the numeration indicator of said first access unit is not different from the numeration indicator of said last access unit, or if said second access unit has not been received;

if said synchronization point flag is set, processing said first access unit if said second access unit has not been received and the numeration indicator of said first access unit is different from the numeration indicator of said last access unit; and

if said synchronization point flag is not set, processing said first access unit if said second access unit has been received and the numeration indicator of said first access unit is equal to the numeration indicator of said last access unit, or if said second access unit has not been received and the numeration indicator of said first access unit is equal to the numeration indicator of said last access unit.

Additionally, according to teachings of the present invention, the numeration indicator field is defined as said AU_sequenceNumber field and said synchronization point flag field is defined as said RandomAccessPointFlag field.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the appended drawings in which:

Fig. 1A is a schematic pictorial illustration of state 1 of a virtual world, useful in understanding the present invention;

Fig. 1B is a schematic pictorial illustration of state 2 of the virtual world, useful in understanding the present invention;

Fig. 1C is a schematic pictorial illustration of state 3 of the virtual world, useful in understanding the present invention;

Fig. 1D is a schematic pictorial illustration of state 4 of the virtual world, useful in understanding the present invention;

Fig. 1E is a schematic pictorial illustration of state 5 of the virtual world, useful in understanding the present invention;

Fig. 2 is a schematic simplified illustration of an MPEG-4 scene description that describes the virtual world of Fig. 1A;

Fig. 3 is a schematic simplified illustration of an MPEG-4 scene description that describes the virtual world of Fig. 1E;

Fig. 4 shows the set of access units that convey the virtual world of Fig. 1A and all subsequent changes of state up to and including state 5;

Fig. 5 shows a set of scene description frames, with their Synchronization Layer (SL) header information, in a sample broadcast over unreliable network of the virtual

world of Fig. 1A and all subsequent changes of state up to and including state 5, according to the present invention; and

Fig. 6 is a flowchart describing the behavior of a receiving terminal when processing SL header information attached to access units of scene description, according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

According to the present invention, two fields are defined in the SL-packet header:

1. A numeration indicator; and
2. A synchronization point flag.

Assuming there are access units x and y, so that access unit y arrives sometime after access unit x, not necessarily consecutively. Assuming also that if access unit x has been successfully received and processed, then access unit y can also be processed, even if all units in between have been lost. If this is also the case for every access unit between x and y, then all the access units from x to y, inclusive, do not change the fundamental state of the scene and therefore, according to the present invention, will be given the same numeration indicator. Assuming also an access unit with its synchronization point flag set to 1 exists in the scene description stream and this access unit conveys the same status of the scene description as was conveyed by preceding access units. The access unit repeats this information for the benefit of receivers that missed the preceding access unit, either because of data loss on the network or because a new user joins a broadcast session. In this case, according to the present invention, the said access unit will be given the same numeration indicator as the preceding one.

The numeration indicator and synchronization point flag fields of the present invention may be new fields, added to the specification of the SL-packet header. Alternatively, use may be made of existing fields, such that the AU_sequenceNumber field of the SL-packet header serves as the numeration indicator and the RandomAccessPointFlag (RAP) field serves as the synchronization point flag. The following description uses the second embodiment by way of an example.

Reference is now made to Fig. 6, which is a flowchart describing the behavior of a receiving terminal when processing SL header information attached to access units of scene description, according to the present invention. In step 100 the terminal receives a new access unit containing a scene description or object description frame. In step 110 the terminal checks whether it had successfully processed the access unit preceding the one that had been received in step 100. If it had, i.e. when no loss of data existed prior to receiving the new access unit, the terminal checks, in step 120, whether the value in the AU_sequenceNumber field of the SL-packet header, labeled AU_#, has changed from the preceding access unit. If the AU_# has changed, the new access unit is processed with no further filtering in step 130. Otherwise, if the AU_# has not changed, the RandomAccessPointFlag (RAP) field of the access unit is checked in step 140. Only if the RAP is not set is the access unit processed, in step 150.

When step 110 shows that loss of data did exist prior to receiving the new access unit, either because of data loss over unreliable network or because a new user joins an existing broadcast session, the terminal checks, in step 160, whether the value in the AU_sequenceNumber field of the SL-packet header, labeled AU_#, has changed from the preceding access unit. If it has changed, the RandomAccessPointFlag (RAP) field of the access unit is checked in step 170 and the new access unit will be processed, in step 150, only if the RAP is set, i.e. it is marked as a synchronization point. If it is not marked as a synchronization point, the terminal must skip this access unit and all subsequent access units which are not synchronization points, until an access unit which is a synchronization point is received (step 180). If step 160 shows that the AU_# has not changed from the previous access unit, the RandomAccessPointFlag (RAP) field of the

access unit is checked in step 140. Only if the RAP is not set is the access unit processed, in step 150.

Further, with respect to the example of Figs. 1A to 1E, reference is now made to Fig. 5, which shows a set of scene description frames with their Synchronization Layer (SL) header information, as can be used to convey the access units of Fig. 4 in broadcast scenario over unreliable network, using the mechanism of the present invention. All frames are accompanied by SL header information that includes, but is not limited to, two fields - AU_sequenceNumber (labeled AU_# hereinafter) and RandomAccessPointFlag (RAP hereinafter). The value of these fields in each of the frames is given:

Frame #1 contains the Scene Replace command that conveys the entire scene of state 1. It has AU_# 1 and RAP set, because this is a synchronization point.

Frame #2 contains the command that changes the person's body position for the first time. Its RAP field is not set, and because the change of position is not considered fundamental, its AU_# is still 1.

Frame #3 is again a Scene Replace command that conveys the entire scene up to date at state 2. Its RAP field is set, because this is a synchronization point, and because it conveys no new information its AU_# is still 1.

Frame #4 contains the command that changes the person's body position for the second time. Its RAP field is not set, and, because the change of position is not considered fundamental, its AU_# is still 1.

Frame #5 contains the command that inserts the globe into the scene. Its RAP field is not set, and because the insertion of a new object is considered fundamental, its AU_# is set to 2.

Frame #6 contains the command that changes the globe's position. Its RAP field is not set, and, because the change of position is not considered fundamental, its AU_# is still 2.

Frame #7 is again a Scene Replace command that conveys the entire scene up to date at state 5. Its RAP field is set, because this is a synchronization point, and because it conveys no new information its AU_# is still 2.

Further, with respect to the same example, Table 1 describes the behavior of a receiving terminal (player), in a sample scenario in which the frames of Fig. 5 are transmitted, but packets 2 and 5 are lost on the network. The table describes the operation of the terminal in this sample scenario, according to the present invention.

Packet #	AU_sequenceNumber	RAP	Receiving Terminal Behavior
1	1	Yes	Player tunes in, this is a RAP so player starts processing AUs
2	1	No	Packet lost
3	1	Yes	This is a synchronization point, ignored by player because loss of data was not fundamental
4	1	No	Process update (even though it's same number as preceding AU)
5	2	No	Packet lost
6	2	No	Cannot process update since it depends on a lost packet. Wait for RAP

7	2	Yes	This is a synchronization point, processed by player because of previous loss of fundamental data

Table 1 - A sample behavior of a player

WHAT IS CLAIMED IS:

1. An error-resilient mechanism for processing scene description streams in scenarios that involve transmission of interactive MPEG-4 scenes over unreliable networks, using ISO/IEC 14496-1 protocol having SL-packetized streams, wherein each SL packet has a header comprising access units having an AU_sequenceNumber field and a RandomAccessPointFlag field, comprising:

defining a numeration indicator field in said SL packet header;

defining a synchronization point flag field in said SL packet header; and

incrementing the numeration indicator of an access unit in said SL packet header if and only if said access unit conveys a fundamental scene change.

2. The mechanism of claim 1, wherein a scene change is considered fundamental if its loss inhibits correct processing of subsequent data.

3. The mechanism of claim 1, wherein setting the synchronization point flag of a first access unit to 1 and setting the numeration indicator of said first access unit equal to the numeration indicator of a second access unit exactly preceding said first access unit indicates no change of scene over said second access unit.

4. The mechanism of claim 3, wherein said setting the synchronization point flag of said first access unit to 1 and said setting the numeration indicator of said first access unit equal to the numeration indicator of said second access unit exactly preceding said first access unit provides a synchronization point for lost data.

5. The mechanism of either of claims 1 to 4, wherein said numeration indicator field is defined as said AU_sequenceNumber field and said synchronization point flag field is defined as said RandomAccessPointFlag field.

6. A method of processing scene description streams in scenarios that involve transmission of interactive MPEG-4 scenes, in a receiving terminal, said scene description streams using ISO/IEC 14496-1 protocol having SL-packetized streams, wherein each SL packet has a header comprising access units having an AU_sequenceNumber field and a RandomAccessPointFlag field, comprising the steps of:

defining a numeration indicator field in said SL packet header;

defining a synchronization point flag field in said SL packet header;

receiving a first access unit;

checking if a second access unit, exactly preceding said first access unit has been received;

checking if the numeration indicator of said first access unit is different from the numeration indicator of a last access unit received before said first access unit;

processing said first access unit if said second access unit has been received and the numeration indicator of said first access unit is different from the numeration indicator of said last access unit;

checking if the synchronization point flag of said first access unit is set, if said second access unit has been received and said numeration indicator of said first access unit is not different from the numeration indicator of said last access unit, or if said second access unit has not been received;

if said synchronization point flag is set, processing said first access unit if said second access unit has not been received and the numeration indicator of said first access unit is different from the numeration indicator of said last access unit; and

if said synchronization point flag is not set, processing said first access unit if said second access unit has been received and the numeration indicator of said first access unit is equal to the numeration indicator of said last access unit, or if said second access unit has not been received and the numeration indicator of said first access unit is equal to the numeration indicator of said last access unit.

7. The method of claim 6, wherein said numeration indicator field is defined as said AU_sequenceNumber field and said synchronization point flag field is defined as said RandomAccessPointFlag field.

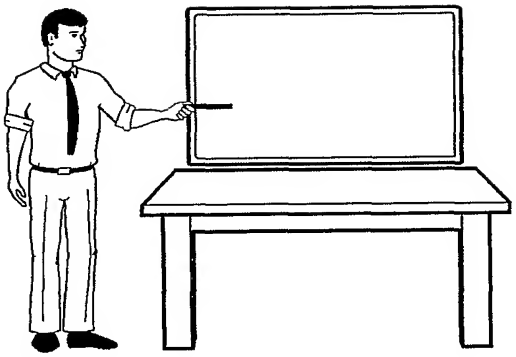


FIG.1A

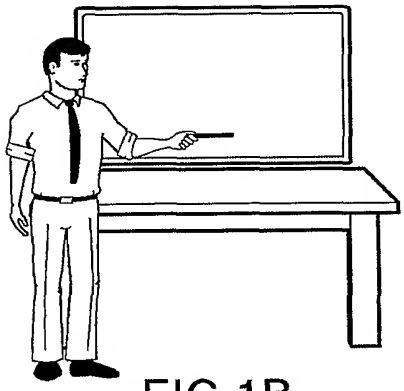


FIG.1B

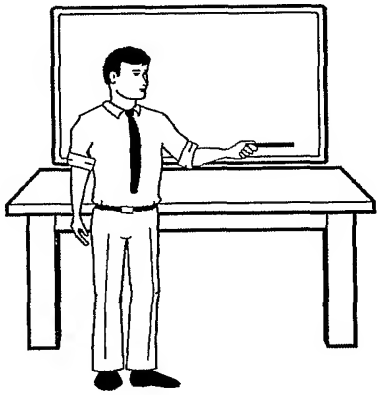


FIG.1C

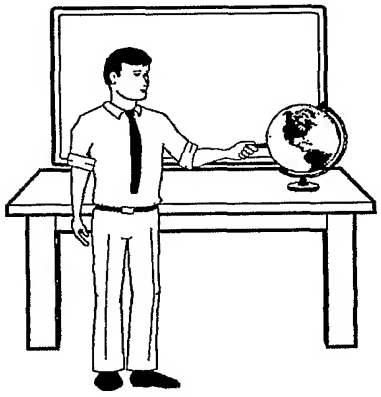


FIG.1D

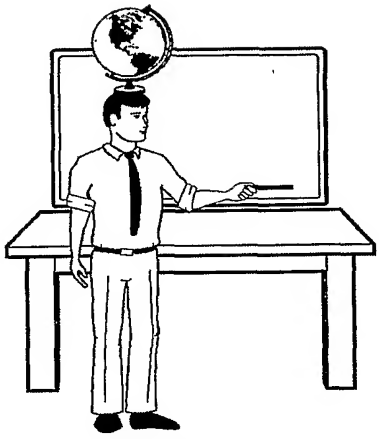


FIG.1E

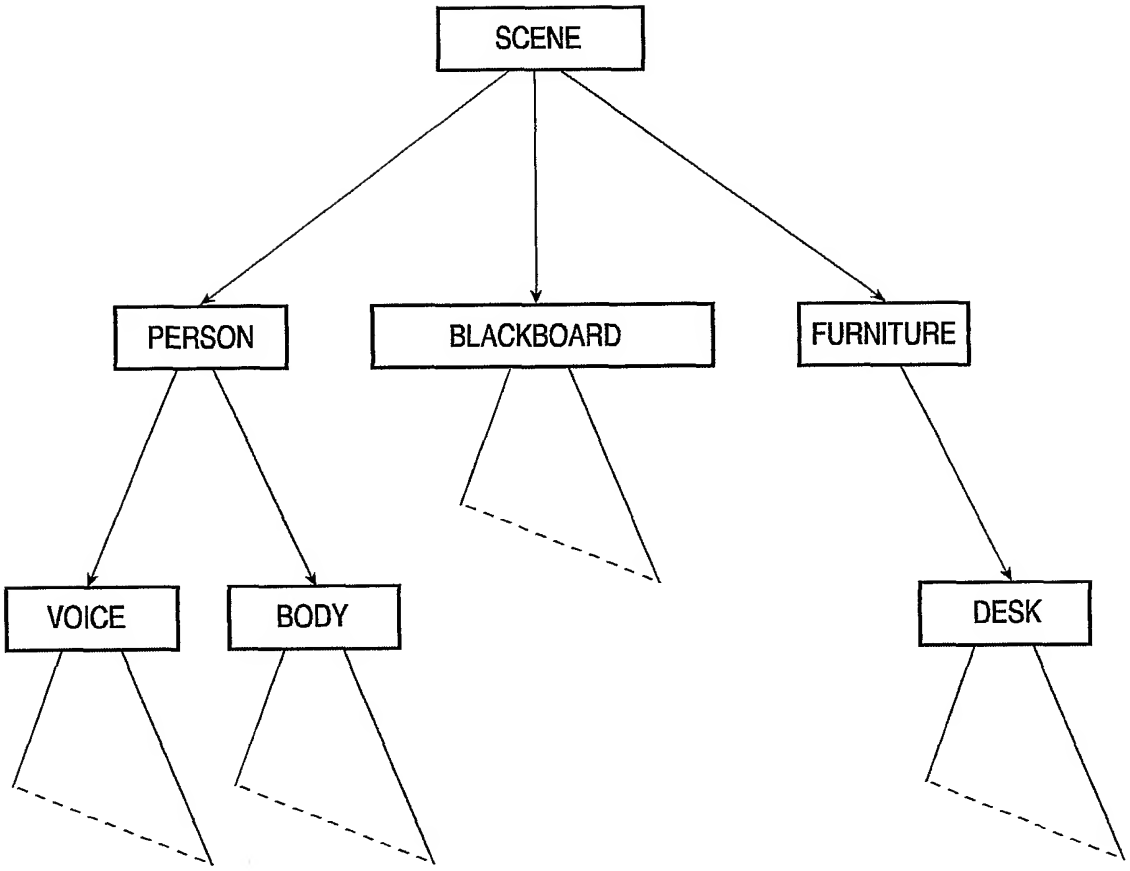


FIG.2

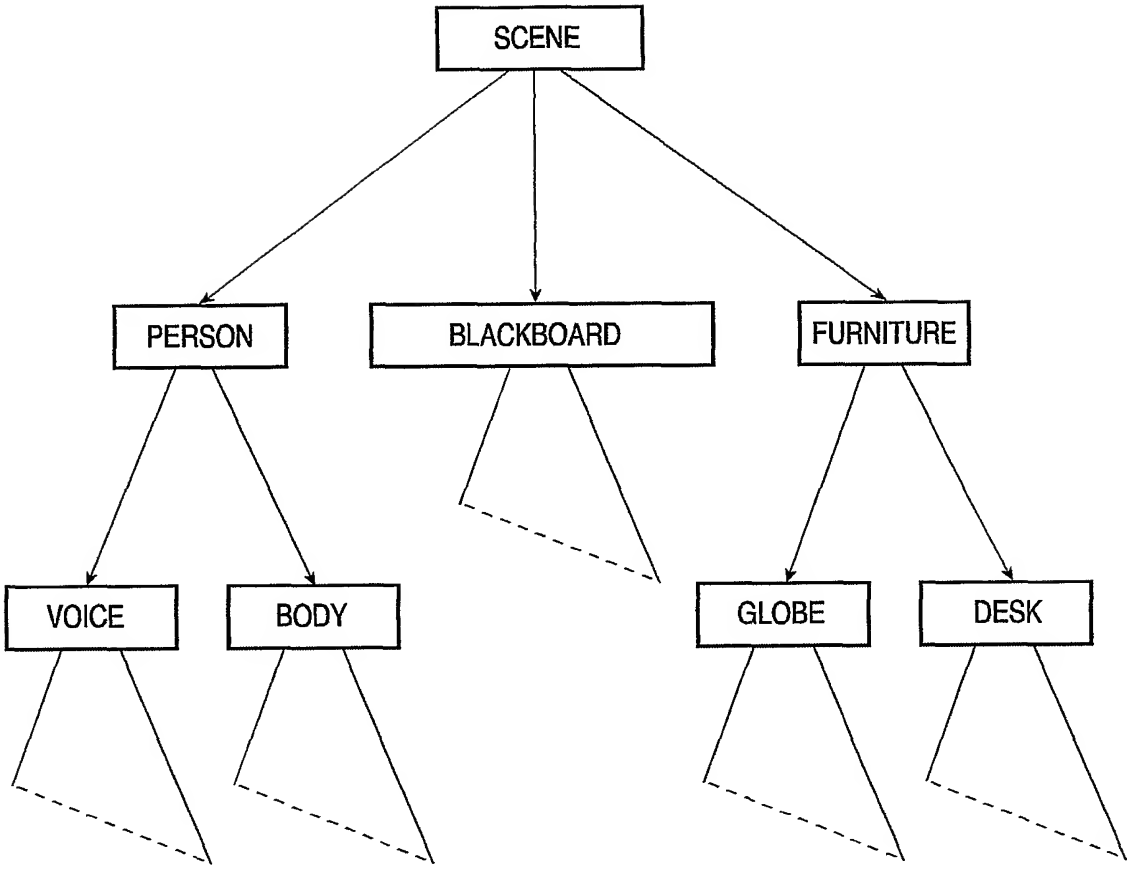


FIG.3

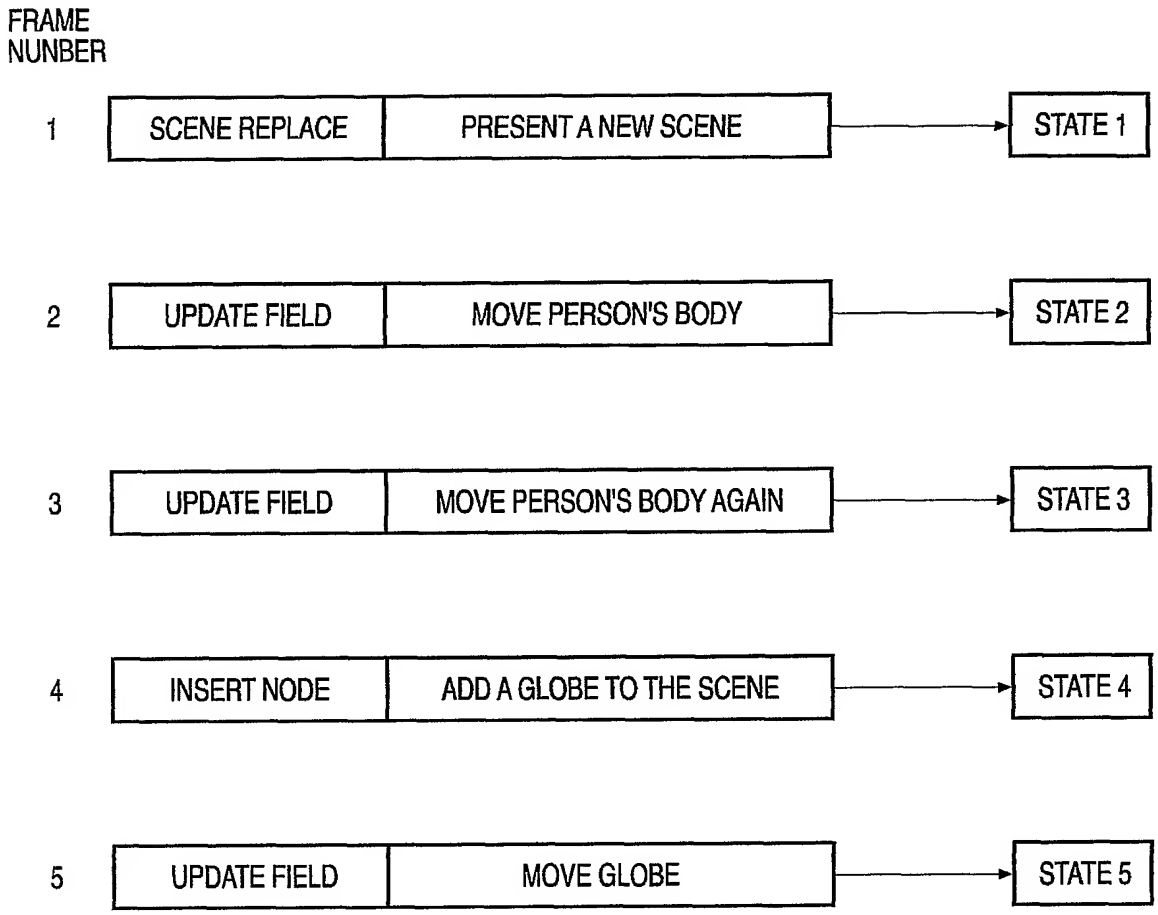


FIG.4 (PRIOR ART)

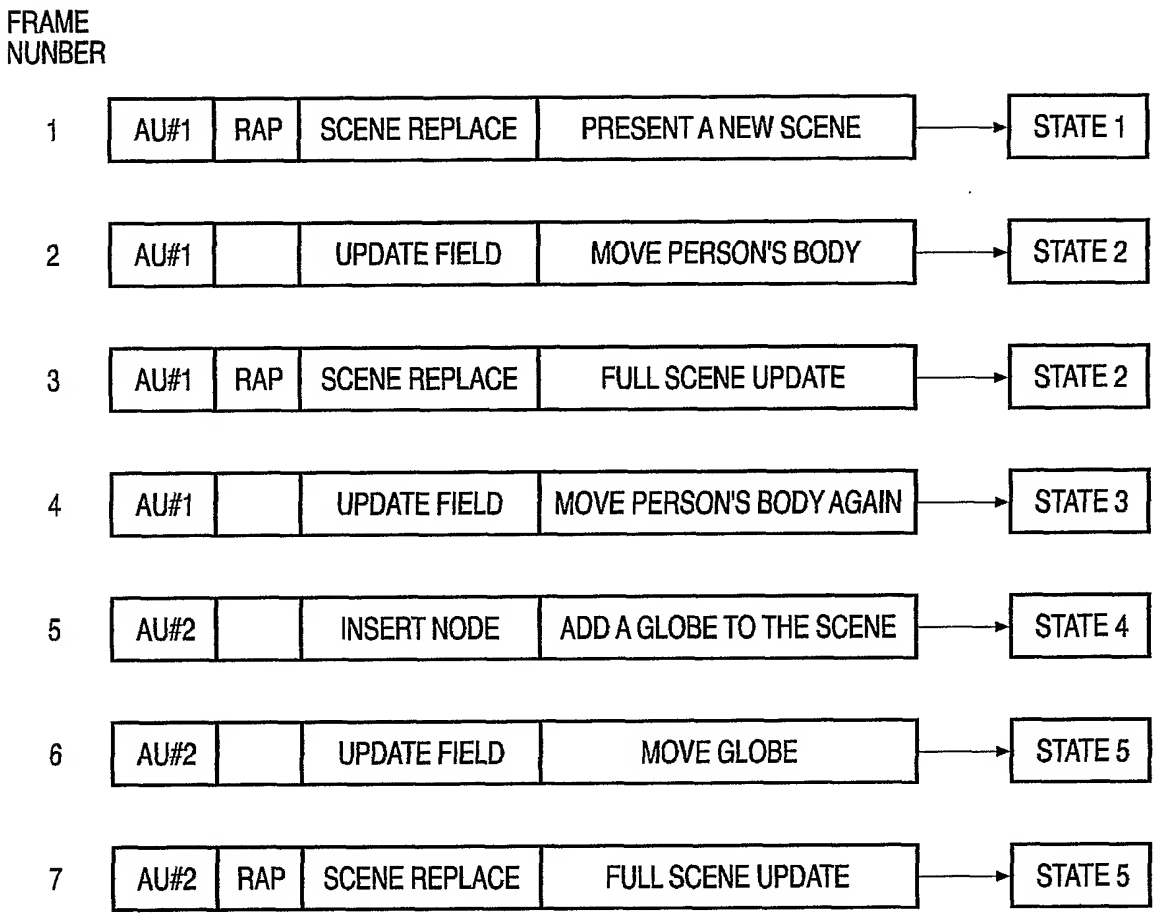

FRAME NUNBER
1
AU#1
RAP
SCENE REPLACE
PRESENT A NEW SCENE
STATE 1
2
AU#1
UPDATE FIELD
MOVE PERSON'S BODY
STATE 2
3
AU#1
RAP
SCENE REPLACE
FULL SCENE UPDATE
STATE 2
4
AU#1
UPDATE FIELD
MOVE PERSON'S BODY AGAIN
STATE 3
5
AU#2
INSERT NODE
ADD A GLOBE TO THE SCENE
STATE 4
6
AU#2
UPDATE FIELD
MOVE GLOBE
STATE 5
7
AU#2
RAP
SCENE REPLACE
FULL SCENE UPDATE
STATE 5

FIG.5

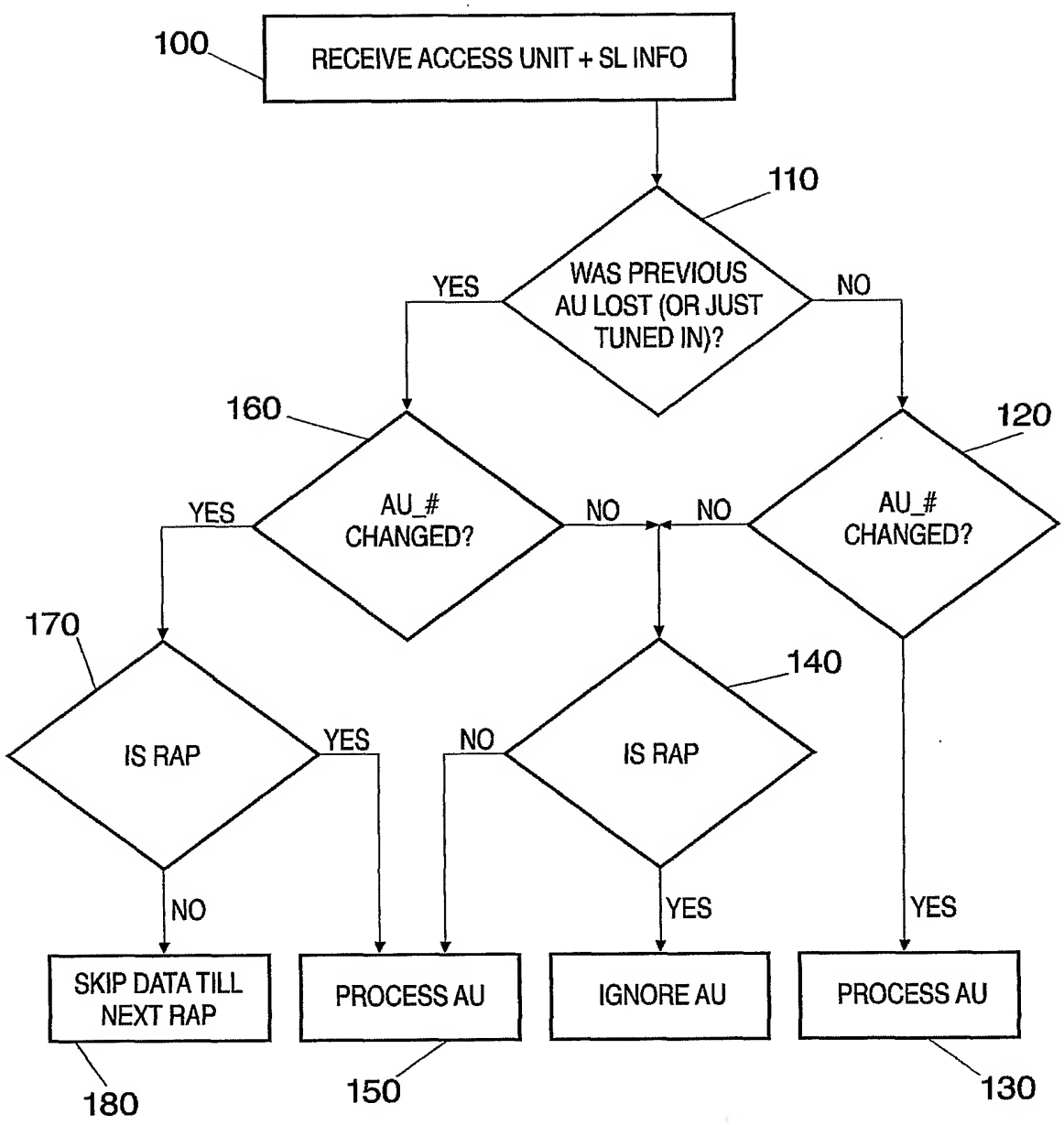

100
RECEIVE ACCESS UNIT + SL INFO
110
WAS PREVIOUS AU LOST (OR JUST TUNED IN)?
YES
NO
160
AU_# CHANGED?
120
AU_# CHANGED?
YES
NO
NO
170
IS RAP
140
IS RAP
YES
NO
NO
YES
YES
SKIP DATA TILL NEXT RAP
PROCESS AU
IGNORE AU
PROCESS AU
180
150
130

FIG.6

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IL 02/00324

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	INTERNATIONAL STANDARDS ORGANIZATION: "ISO/IEO International Standard 14496-1, Information technology - Coding or audio-visual objects - Part 1: Systems" ISO/IEC, 15 December 1999 (1999-12-15), pages 192-203, XP002207352	1,2,5
A	Section 10.2.4: SL Packet Header Specification	3,4,6,7

P,A	EP 1 133 189 A (SANYO ELECTRIC CO) 12 September 2001 (2001-09-12) abstract paragraph '0045! - paragraph '0061! figures 2,5	1-7

	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 July 2002	13/08/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Hampson, F

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IL 02/00324

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	HERPEL C ET AL: "MPEG-4 SYSTEMS: ELEMENTARY STREAM MANAGEMENT" SIGNAL PROCESSING. IMAGE COMMUNICATION, ELSEVIER SCIENCE PUBLISHERS, AMSTERDAM, NL, vol. 15, January 2000 (2000-01), pages 299-320, XP000885367 ISSN: 0923-5965 section 3.10: Object descriptor usage for multicast or MPEG-4 content section 4.2: The sync layer	1-7

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IL 02/00324

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1133189 A	12-09-2001	JP 2001258023 A	21-09-2001
		JP 2001258025 A	21-09-2001
		JP 2002051334 A	15-02-2002
		EP 1133189 A2	12-09-2001
		US 2001027468 A1	04-10-2001

DERWENT-ACC-NO: 2003-129200

DERWENT-WEEK: 200452

TITLE: Error resilience e.g. for system streams in MPEG-4, increments numeration indicator of access unit if and only if access unit conveys fundamental scene change

INVENTOR: LIFSHITZ Z

PATENT-ASSIGNEE: OPTIBASE[OPTIN]

PRIORITY-DATA: 2001US-288081P (May 3, 2001)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
WO 02091748 A1	November 14, 2002	EN
AU 2002307785 A1	November 18, 2002	EN

DESIGNATED-STATES: AE AG AL AM AT AU AZ BA BB BG
BR BY BZ CA CH CN CO CR CU CZ
DE DK DM DZ EC EE ES FI GB GD
GE GH GM HR HU ID IL IN IS JP
KE KG KP KR KZ LC LK LR LS LT
LU LV MA MD MG MK MN MW MX MZ
NO NZ OM PH PL PT RO RU SD SE S
G SI SK SL TJ TM TN TR TT TZ UA
UG US UZ VN YU ZA ZM ZW AT BE
CH CY DE DK EA ES FI FR GB GH
GM GR IE IT KE LS LU MC MW MZ
NL OA PT SD SE SL SZ TR TZ UG

ZM ZW

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
WO2002091748A1	N/A	2002WO-IL00324	April 24, 2002
AU2002307785A1	Based on	2002AU-307785	April 24, 2002

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	H04N7/24 20060101

ABSTRACTED-PUB-NO: WO 02091748 A1

BASIC-ABSTRACT:

NOVELTY - The mechanism increments the numeration indicator of an access unit if and only if the access unit conveys a fundamental scene change. The synchronization point flag of an access unit is set to 1 and the numeration indicator of the access unit is set equal to the numeration indicator of an exactly preceding access unit to indicate no change of scene.

DESCRIPTION - An INDEPENDENT CLAIM is included for a method of processing scene description streams

USE - For error resilience of system streams in MPEG-4

DESCRIPTION OF DRAWING(S) - The figure shows a set of scene description frames with their Synchronization Layer header information in a sample broadcast over unreliable network of the virtual world and all subsequent changes of state up to and including state 5 according to the invention.

CHOSEN-DRAWING: Dwg.5/6

TITLE-TERMS: ERROR RESILIENT SYSTEM STREAM INCREMENT NUMERATOR INDICATE ACCESS UNIT CONVEY FUNDAMENTAL SCENE CHANGE

DERWENT-CLASS: T01 W02 W04

EPI-CODES: T01-G01A1; T01-N01D; W02-F07M; W04-P01A;

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: 2003-102681